PHILIPS

sweep generator

PM 5164

9445 051 64011

9499 450 04911

72111701

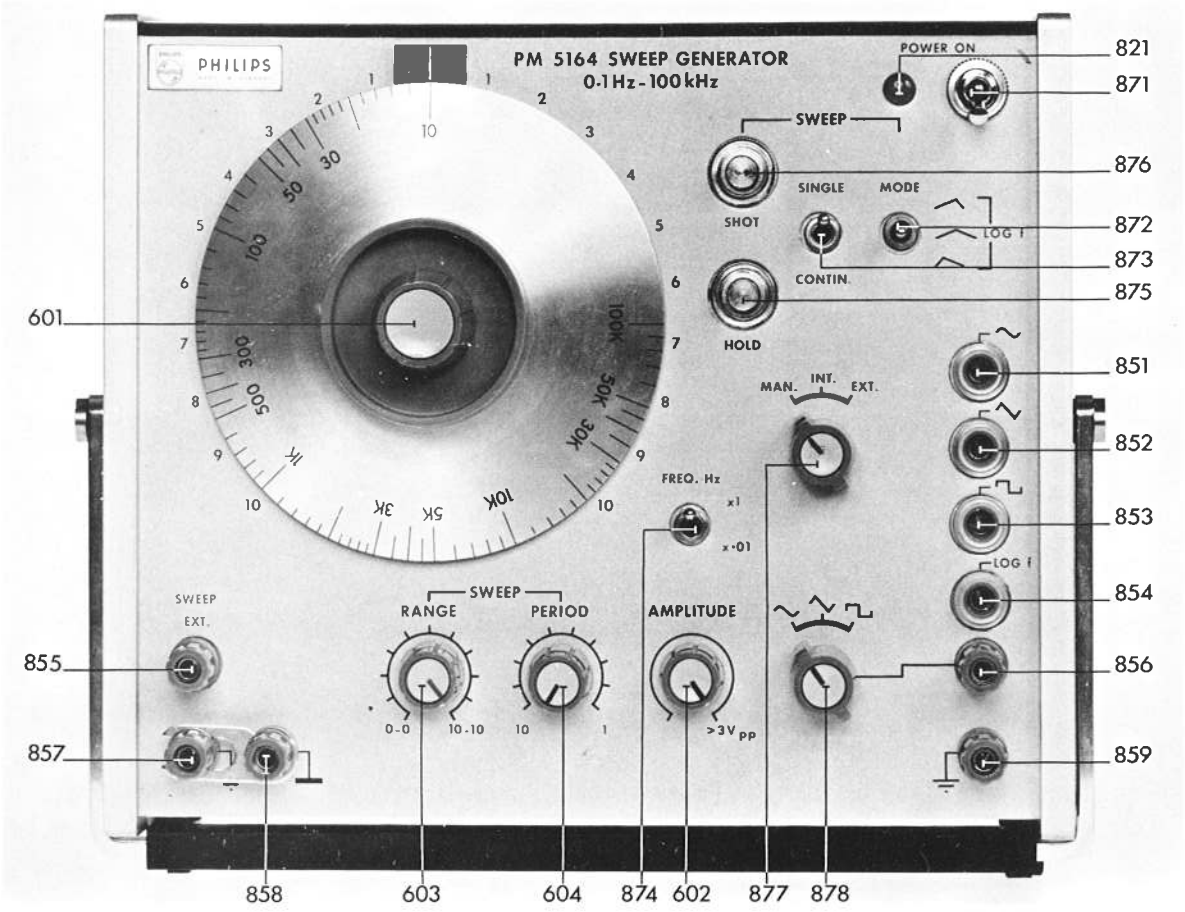

Fig. 2. Front view, controls and sockets

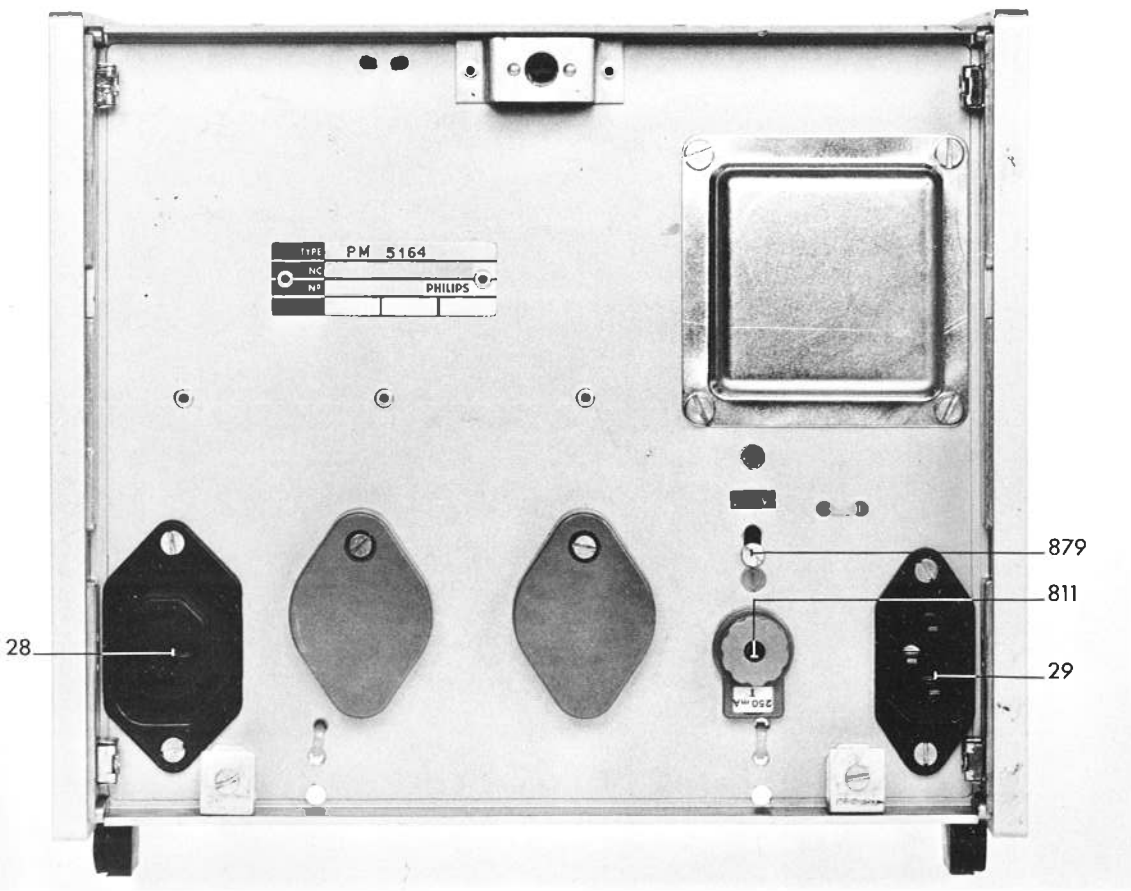

Fig. 3. Rear view, controls and sockets

1.2. TECHNICAL DATA

Only properties expressed in numerical values with tolerances or limits stated are guaranteed by the manufacturer.
Unless specified otherwise:
- fault properties and nominal values of parameters are referred to 1 kHz in range x 1
- relative faults are given in percents of the adjusted values
- a.c. voltages are given in r.m.s. values

Frequency

Reference value	1000 Hz on range x1
Range	0.1 Hz to 100 kHz
Bands	2 bands: 0.1 Hz to 1 kHz 10 Hz to 100 kHz
Scale	logarithmic: 10 to 100 k
Setting error limits	± 10 % of the adjusted frequency
Temperature coefficient	< 0.3 %/°C
Long-term drift	< 0.3 % in 24 hours, after a warming-up period of 20 minutes
Short-term drift	< 0.3 % in 15 minutes after a warming-up period of 20 minutes

Input

for SWEEP EXT.

Outputs

Three fixed outputs	- sine wave - square wave - triangular wave.
One output with a variable amplitude and a switch for selecting	- sine wave - square wave - triangular wave
Output LOG.f.	Output voltage proportional to the logarithm of the generator frequency
Max. load	all outputs are short-circuit proof and don't influence each other

Output characteristics

Sine-wave mode

Output voltage	10 V_{pp} ± 5 % open-circuit voltage
Frequency-response limits	± 0.1 dB up to 20 kHz ± 0.5 dB up to 100 kHz
Distortion factor at 25 °C	< 1 %
Additional distortion factor due to temperature influence	< 0.01 %/° C
Hum and noise	> 60 dB down (max. output)
Max. d.c. offset voltage	100 mV
Temperature coefficient output voltage	< 0.1 %/° C
Internal resistance	600 Ω ± 10 Ω

Triangular mode

Output voltage	10 V_{pp} ± 5 % open-circuit voltage
Frequency response limits	± 2.5 % up to 100 kHz
Non-linearity (referred to a straight line through both peak values)	< 1 % of the maximum amplitude on the whole frequency range
Asymmetry	< 0.5 % of one period, on the whole frequency range
Hum and noise	> 60 dB down (max. output)
Maximum d.c. offset voltage	100 mV
Temperature coefficient output voltage	< 0.1 %/° C
Internal resistance	600 Ω ± 10 Ω

Square-wave mode

Output voltage	10 V ± 5 % open-circuit voltage
Duty cycle	0.5 ± 0.005
Frequency response limits	± 1 % up to 20 kHz ± 2 % up to 100 kHz
Rise and fall time	< 100 ns
Overshoot	< 2 %
Droop	< 1 %
Hum and noise	> 60 dB down (max. output)
Maximum d.c. offset voltage	100 mV
Temperature coefficient output voltage	< 0.1 %/° C
Internal resistance	600 Ω ± 10 Ω

VAR-output — selectable: sine-, triangle- or square-waves

Output voltage	0...≥ 6.4 V_{pp} open-circuit voltage
Temperature coefficient	< 0.1 %/° C
Nominal range of the adjustable attenuation	0...≥ 20 dB
The remaining data are those mentioned under sine-, triangular and square-wave modes	

LOG.f-output

Nominal voltage	$(\log \frac{100f}{Hz} - 1)$ V on range f=0.1 Hz up to 1 kHz $(\log \frac{f}{Hz} - 1)$ V on range f=10 Hz up to 100 kHz
Range	0 - 4 V (1 V/decade)
Inaccuracy	± 0.1 V
Internal resistance	< 0.1 Ω
Load resistance	≥ 1 kΩ

Modes of operation

Manual	Frequency adjustment by means of range selector and dial with coarse/fine control
Internal	Frequency control by an internal sweep oscillator
Sweep range	± 2 decades max., at central frequencies 1 kHz and 10 Hz respectively; adjustable with control SWEEP RANGE
Sweep mode	selectable by switch SWEEP MODE : sawtooth with short trailing edge : triangular form : sawtooth with short leading edge
Period time	adjustable by selector SWEEP PERIOD 10...100 s for sawtooth forms 20...200 s for triangular form
Rise respectively fall time of the steeper edges	< 1 s
Control signal-hold	by pressing of push-button HOLD
Frequency deviation during operation of the signal-hold push button	< 1 % per minute
Control signal duration	selectable by switch SINGLE/CONTIN. single-period sweep continuous sweep
Producing a single period sweep	by means of push-button START (SHOT)
External	Frequency control by external voltage at socket SWEEP EXT.
Control function	$f_o = f_s \cdot 10^{v/V}$ f_o = frequency of the output signal f_s = frequency adjusted by dial and range selector v = external control voltage Note: This formula only holds under the condition that control SWEEP RANGE is set fully clockwise (10-10), because it is still in the circuit.
Sweep range	± 2 decades max. at $\hat{v}$ = ± 2 V
Control voltage	
Nominal range	-2 V to +2 V
Max. permissible input voltage	± 4 V
Max. frequency	50 Hz for sawtooth waveforms 25 Hz for triangular waveforms The frequency of the sweep signal however, must be less than the lowest frequency of the sweep range already adjusted

Power supply

Mains voltage	230 Va.c. or 115 Va.c. ± 15 %
Reference value	230 V
Mains frequency	50 - 100 Hz
Power consumption	46 VA; 40 W

Environmental conditions

Reference temperature	+25 °C
Nominal operating temperature	+5 to +40 °C
Temperature range for storage and transport	-40 to +70 °C

This instrument conforms to VDE 0411 class I protection standard and meets V.D.E. Störgrad K concerning radio interferences

Mechanical data

Dimensions

Height	over all	192 mm
Width	over all	232 mm
Depth	over all	288 mm
Weight		4.5 kg

1.3. ACCESSORIES

1.3.1. Normal accessories

1 mains cable
1 manual
1 delayed-action fuse with label (for 115 V operation)

1.3.2. Optional accessories

Extension test board for power supply 5322 263 70035
Extension test board for unit A and unit B 5322 466 10163

1.4. DESCRIPTION OF THE BLOCK DIAGRAM (Fig. 1)

The generator frequency is produced in the triangle/square wave oscillator. The square-wave signal goes to output socket ⊓ (853). The triangular signal, however, goes to output socket ∿ (852) as well as to the sine shaper. In the sine shaper the triangular signal is converted into a sine-wave signal, which is available at output socket ∿ (851). The amplitude of the above mentioned output signals are not variable.

Output socket 856 (VAR) supplies a signal, the shape of which depends on the position of switch ∿/⩘/⊓ (878). The amplitude of the selected waveform can be varied by means of continuous control AMPLITUDE (602). The output amplifier is an emitter follower.

The frequency range of the generator is divided into two sub-ranges (0.1 Hz to 1 kHz and 10 Hz to 100 kHz). With switch FREQ. Hz (874) these sub-ranges can be selected. By means of a control voltage, supplied to the triangle/ square wave oscillator, the frequency can be adjusted or controlled within the above mentioned sub-ranges.

The kind of control voltage can be selected with switch MAN./INT./EXT. (877).

In position MAN. the d.c. voltage across Freq. Hz potentiometer 601 (frequency dial) is used as a frequency determing control voltage for the triangle/square wave oscillator.

In position INT. the control voltage is taken from the control circuit, where two voltages are mixed together, viz. the output voltage of the sweep oscillator and the d.c. voltage form freq. Hz potentiometer 601. The position of freq. Hz potentiometer 601 determines the central frequency of the sweep.

In position EXT., frequency control can be obtained in the same way; in this case, however, the sweep signal is not taken from the built-in sweep oscillator but outside via input socket SWEEP EXT. (855).

The control signal, which is proportional to the logarithm of the frequency goes also, via LOGf-amplifier to output socket LOG f (854).

The sweep oscillator delivers signals for sweeping the frequency of the triangle/square-wave oscillator. The shape of these signals is selectable with switch MODE ⩘/⩙/⩘ (872), and the frequency may be varied, with a ratio 1 : 10, by means of control SWEEP PERIODE (604). Switching over from continuous-to single sweep is effected by selector SINGLE/CONTIN (873). By pressing button 876 (START or SHOT) one single period of the driving triangular voltage is produced. Interruption of the sweep is possible with push button HOLD (875). As long as this button is pressed, the signal frequency at the generator outputs remains constant; after release of the button the sweep is continued. The sweep range can be controlled over ± 2 decades by varying the amplitude of the driving triangular voltage with control SWEEP RANGE (603). This control functions also in position EXT. of switch 877.
Via control SWEEP RANGE the sweep signal is supplied to the control circuit.

The power supply delivers the required stabilized d.c. voltages.

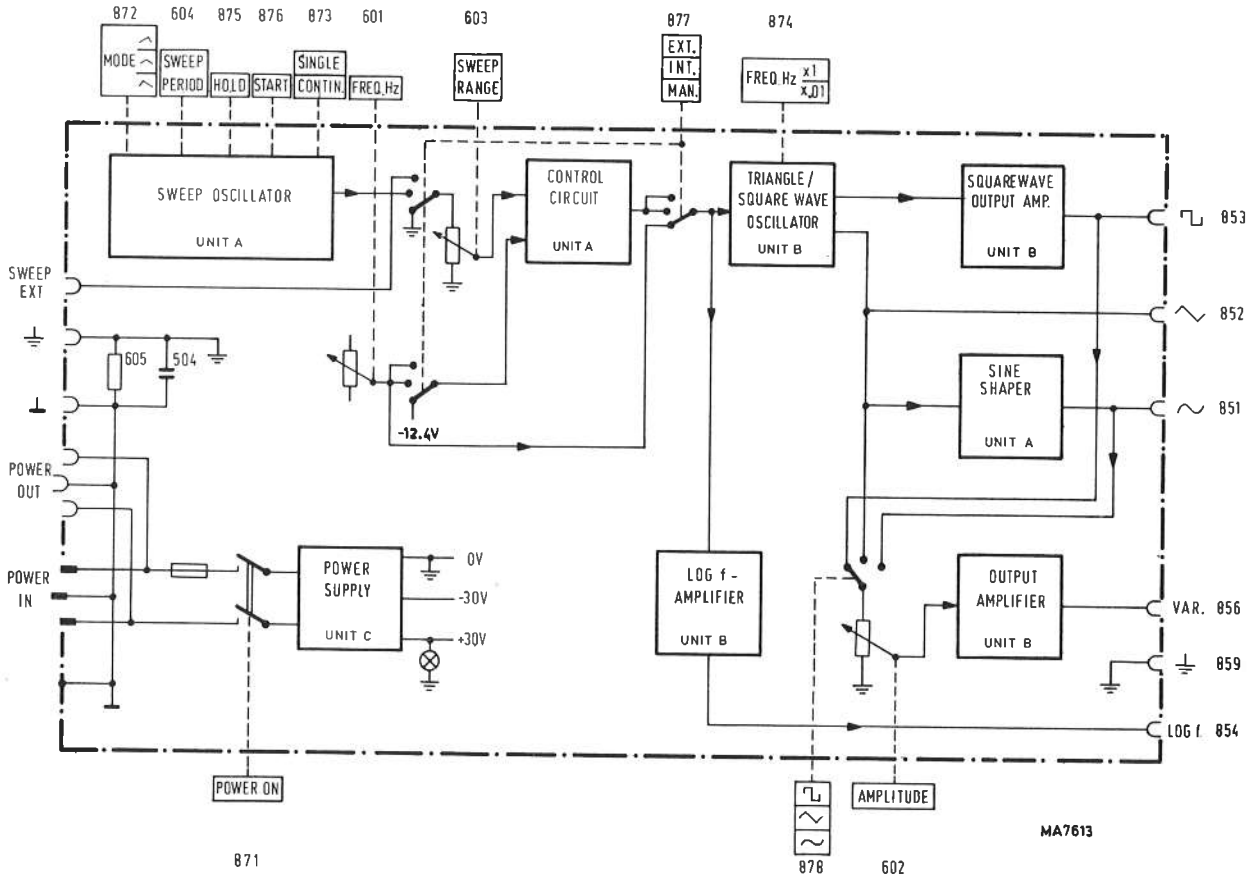

Fig. 1. Block diagram

3.5. FAULT FINDING

To facilitate fault finding some d.c. voltage present at various places in the circuit have been indicated in the circuit diagram (Fig. 22). This voltages are measured with a PM 2411 multimeter and a PM 3231 double beam oscilloscope under the following conditions:

- switch MODE in position ⌒
- switch SINGLE/CONTIN. in position SINGLE
- switch MAN./INT./EXT. in position MAN.
- control RANGE anti-clockwise 0-0
- control PERIOD anti-clockwise 10
- control AMPLITUDE clockwise > 3 V_{pp}
- switch ∿/⩘/⊓ in position ∿
- switch FREQ. Hz in position x1
- frequency dial at 1 kHz

Note: The indicated voltage levels surve only as a guide. If necessary, extension test boards can be used for fault finding.

To replace parts, the instrument should be switched off.
After replacing parts, it may be necessary to re-adjust the instrument according to chapter 3.4. "Checking and adjusting".

MODE
SWEEP PERIOD
HOLD
START
SINGLE CONTIN.
SWEEP OSCILLATOR
UNIT A
SWEEP RANGE
CONTROL CIRCUIT
UNIT A
EXP. CURRENT
LOG f-AMPLIFIER
SWEEP EXT
POWER IN
POWER OUT
POWER ON
POWER SUPPLY
UNIT C
MAN. INT. EXT.
22 x BAX 13
BAX 13
BZX 70-C
BZX 75-C
BZX 79-C
BZY 78
BY 164
BCY 56
BCY 59
BCY 70
BSX 19
BCY 98
BGY 20
BFW 10
BFW 11
2N 2219
TAA 521
751
	S1	S1*	S2a	S2b	S3a	S3b
TURNS	750	750	205	87	205	87
RMS VOLTAGE	115	115	31,4	14,9	31,4	14,9
I RMS A	1,03	3,36	1,9	2,0	4,2	2,2
ø	0,25	0,25	0,42	0,42	0,42	0,42

* SELECT IN TEST
** VOLTAGES MEASURED AT 10Hz IN RANGE ×01
⏚ SIGNAL EARTH
⊥ CHASSIS EARTH

TRIANGLE/ SQUARE-WAVE OSCILLATOR

UNIT B

EXP. CURRENT SOURCE

LOG f-AMPLIFIER

SINE SHAPER

UNIT A

(LOG f AMPL.)

OUTPUT AMPL.

UNIT B

Fig. 22. Overall circuit diagram